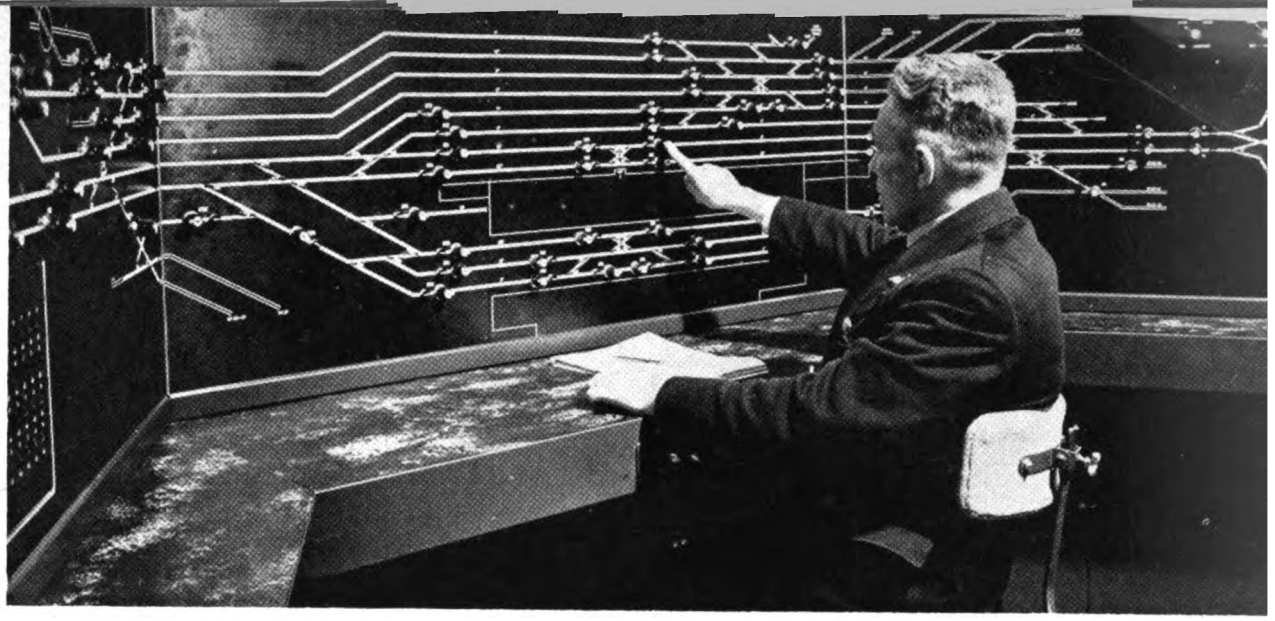


Entrance - exit control machine for a new interlocking on Netherlands Ry.

New Interlocking In Holland

By J. H. Verstegen
Chief Signal Engineer,
Netherlands Railways

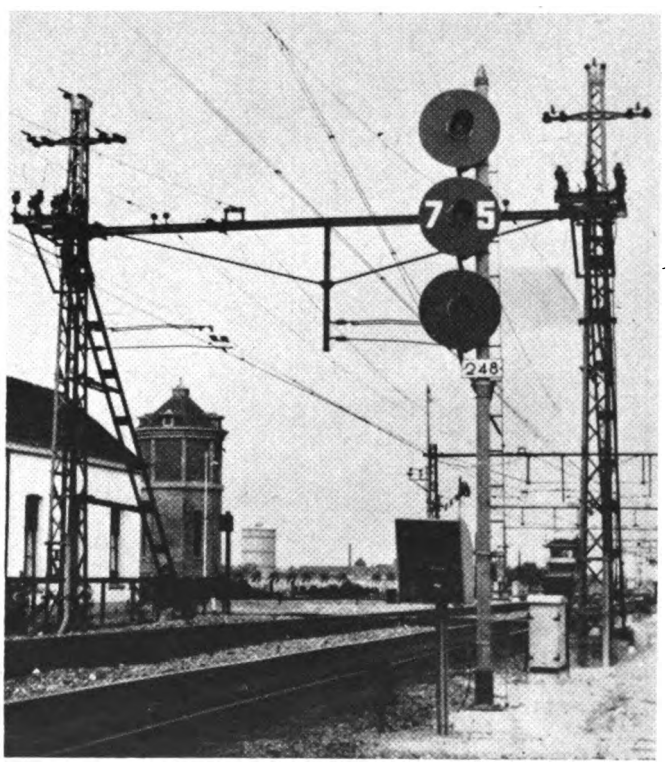
First NX plant on European continent, installed at 's Hertogenbosch, includes interesting signaling aspects and controls

THE first installation of a completely centralized signaling relay interlocking in the Netherlands was successfully brought into operation September 3, 1950. This station, which was almost completely destroyed during the war, is the first of many to be converted to this type of interlocking.

In the past, increased traffic, which could not be handled by the old type of mechanical interlockers, had already led, here in Holland, to a more concentrated form of electrical interlocking. After the war, however, increasing traffic. and further extension of layouts made it necessary to introduce a type of control machine, easier to control and provide better automatic operation. A decision was then made to use the latest developments of the all-relay installations, and after a thorough study, the NX type interlocking of the General Railway Signal Company was chosen. The new plant at 's Hertogenbosch comprises: 91 switch machines, 1 switch lock, 75 signal units, and about 80 track circuits. In total, about 2,300 relays are used, providing 15,000 to 20,000 contacts. Further, about 125 miles of wire and 38 miles of cable are installed.

The whole layout from Block post "Bossche Gasfabriek" in the direction of Vught to Post I at the Dieze bridge, in the direction of Hedel and Rosmalen, is included in the NX interlocking. If in the future the control of the highway crossing and the bridge is no longer wanted, both posts can be included in the NX system. The sorting yard, which is not NX controlled, is supervised by Post II. The entrance and exit to the yard, however, are controlled from the main tower. The factory sidings and goods' shed are not included in the NX control.

The operating machine of the NX system is condensed into a panel representing a diagram of the track layout. The tracks and switches are engraved in white on a black background. The signals are represented by entrance knobs placed on the tracks. To set up a route for a main, or for a shunt move, the operator has only to operate an entrance knob at the beginning of the route,



The three-unit type high home signal. Numbers on middle unit indicate maximum speed, k.p.h.

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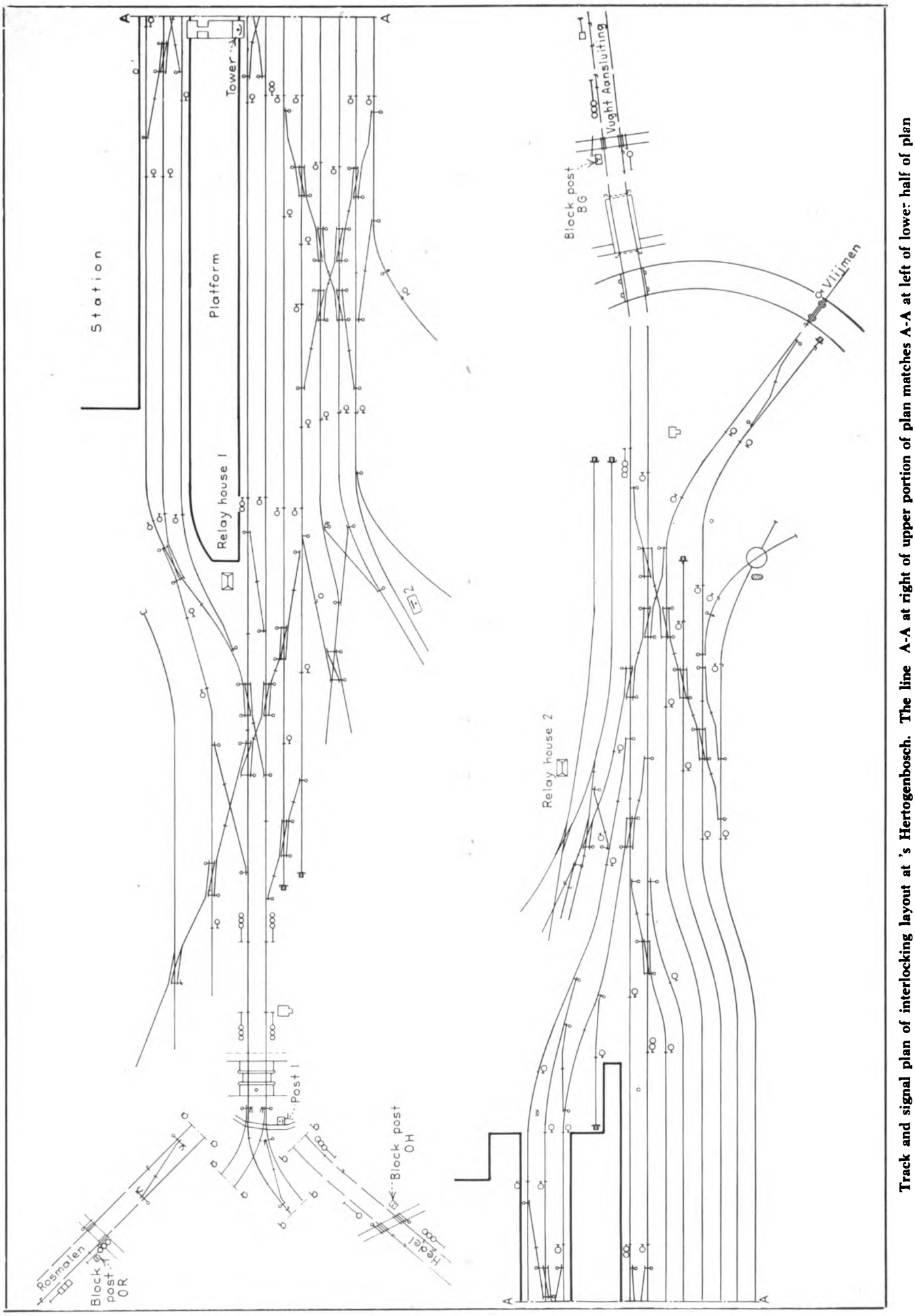

Track and signal plan of interlocking layout at 's Hertogenbosch. The line A-A at right of upper portion of plan matches A-A at left of lowe: half of plan

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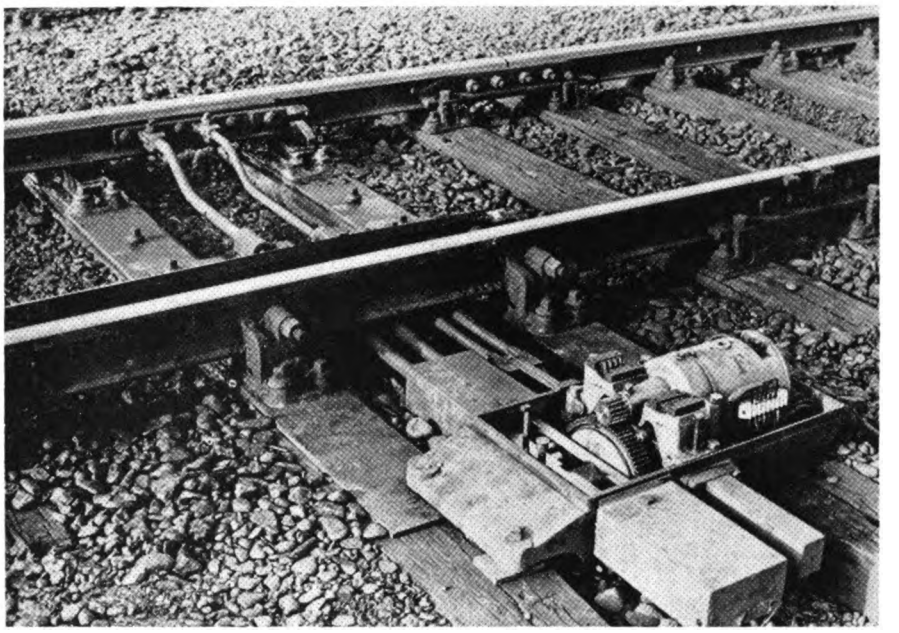
and an exit button at the end of the route. The operation and locking of the switches, checking of opposing and conflicting routes, track control and clearing of the signals is established automatically by the NX system.

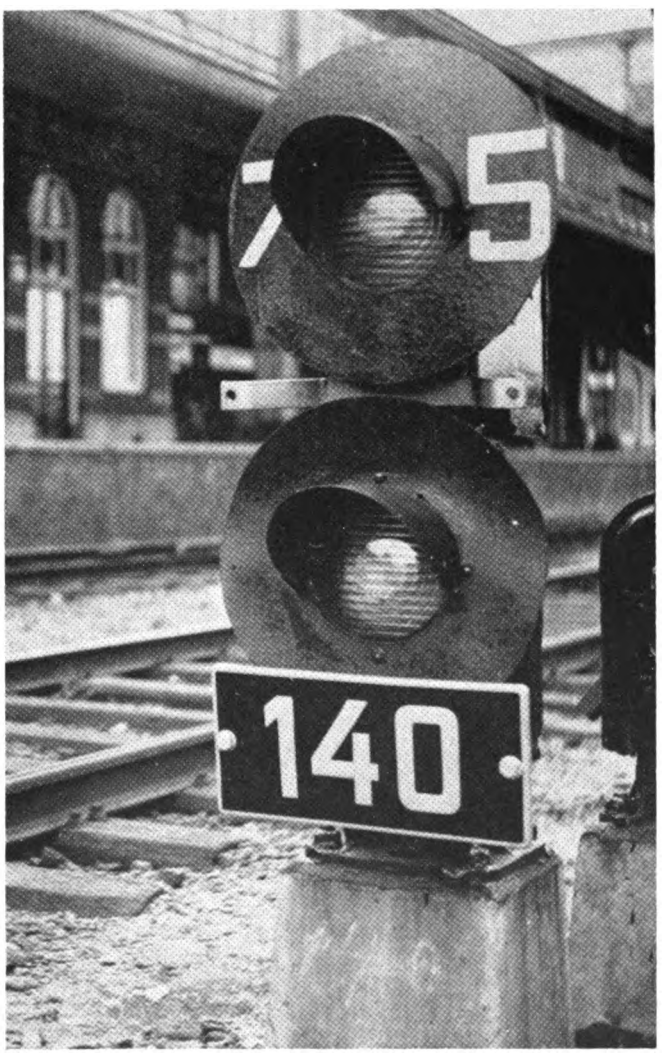
Operation of Machine

The panel shows a complete picture of events; movable switch indicators show the switch position, and the route lined up, while illuminated lights show track occupation and signal aspects. If two or more routes between entrance and exit points are possible, and the preferred route is not available, then the system automatically selects the next best available route. For a train movement through the plant, it is sufficient to operate only the first entrance knob and final exit button; all intermediate signals will clear automatically. Each switch can be operated separately by an individual lever situated in a row at the top of the panel.

The interlocking machine is of the floor type, consisting of three sections. The entrance buttons can be pushed, turned down, or turned up. To initiate a route for a main movement, the operator pushes the entrance knob; and then a red lamp placed in the barrel of the knob is lighted. When the exit button is pushed and the signal has cleared, this red lamp is replaced by a yellow one. By pulling the entrance knob out, the route set will be cancelled. For a shunt movement or a train movement to an occupied track, the entrance knob has to be turned down. When the signal has cleared, the red indicating light is replaced by flashing yellow.



The switch machine, made in Holland, is trailable



Two-unit dwarf. Numerals on the upper unit show top speed, kilometer per hour

Approach buttons are placed in the entrance tracks of the layout. An incoming train is announced from a certain distance (3,000 meters) by a bell and the illumination of a white lamp in the barrel of the approach buttons. When the approach button is pushed, the bell stops ringing. The white lamp is extinguished when the train has entered the layout. The switches included in a lined up route are indicated by red lights associated with the route indicators (lock lights). Track occupation is indicated by illumination of white track lamps. As the rear of the train leaves the section of the route concerned, the lock lights and track lights are extinguished. Beneath the test keys, used for individual operation of the switches, white lamps are placed, which light up when the switch is out of correspondence with the position called for by a route lined up or by operation of the key.

Summary of Advantages

Summarizing, it can be said that the NX interlocker for this new plant provides the following advantages:

(1) A simple, quick and partly automatic control of a large layout with an easily operated control

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A. SINGLE UNIT LIGHT SIGNALS

(1) Single Unit High Signals

Max. speed

Max. speed; next signal at stop

75 fl. p/m; Next stop signal at less than braking distance

Stop

(2) Single Unit Dwarf Signals

Within the station limits low speed; on open track max. speed

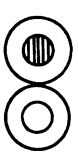
Low speed; next signal at stop

75 fl. p/m; Next stop signal at less than braking distance

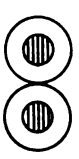
180 fl. p/m; Be prepared to stop on sight; no track circuit protection

Stop

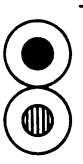
B. TWO UNIT DWARF SIGNALS



Within the station limits medium speed; on open track max. speed



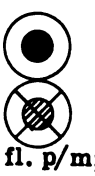
Medium speed; next signal at low speed



Within the station limits low speed; on open track max. speed

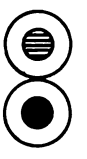
Medium speed; next signal at stop

Low speed; next signal at stop



75 fl. p/m; Next stop signal at less than braking distance

180 fl. p/m; Be prepared to stop on sight; no track circuit protection

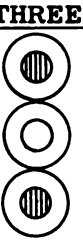


Stop

C. THREE UNIT HIGH SIGNALS

Max. speed; next signal also at max. speed

Max. speed; next signal at medium speed

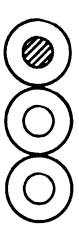


Max. speed; next signal at low speed

Medium speed

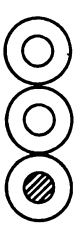
Medium speed; next signal at low speed

Low speed

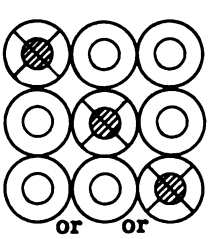


Max. speed; next signal at stop

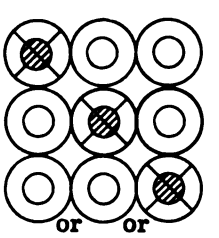
Medium speed; next signal at stop



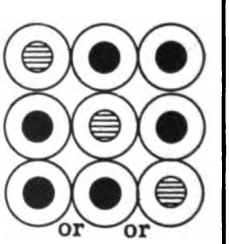
Low speed; next signal at stop



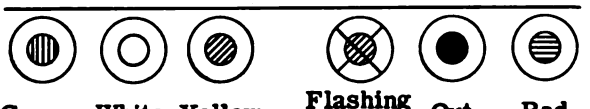
75 fl. p/m; Next stop signal at less than braking distance



180 fl. p/m; Be prepared to stop on sight; no track circuit protection



Stop



KEY TO COLOR LIGHT SYMBOLS

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panel. The old interlocker of this yard made a division in three interlocked controllers necessary, requiring five men. Now the control is concentrated in one signal tower and requires one man—during very busy hours, two.

(2) A complete protection of all trains and shunt moves is accomplished. Shunting can be done without aid of a yardman.

(3) Track circuits prevent a train entering an occupied section as the signals can only be cleared when the concerned route is unoccupied. For movements into occupied tracks, a special signal aspect is to be shown.

New Searchlight Signals

General Railway Signal Company type SA searchlight signals are used as signal units. High signals consist of either three vertical units or of one unit. Dwarf signals are placed within the station limits, consisting of one unit. Dwarf signals placed on through routes, where a speed of 75 km/h is permitted, consist of two units. The principles on which the signal aspects are based, are the same as used for the Dutch automatic block section; the color red is used for Stop, yellow for Caution, and green for Proceed.

A red signal is always proceeded by a yellow one; steady yellow if the Stop signal is beyond braking distance, and yellow flashing at 75 per minute if the Stop signal is at less than braking distance. In the last instance, the signal proceeding the yellow flashing 75 aspect will show yellow. A signal proceeding a steady yellow signal or a green signal will show green. Further for train or shunt moves into an occupied section, the signal will show yellow flashing at 180 per minute.

Signal Aspects

The various aspects of the two- and three-unit signals are shown herewith. In the two-unit signals, the lower unit indicates low speed (max. 45 km/h), the top unit indicates medium speed, depending on circumstances 60 to 90 km/h (the permitted medium speed is shown on the background of the top unit). In case the top unit shows a green or yellow aspect, the lower unit will show lunar white in order to show the level of the green or yellow aspect. A two unit signal gives also information about the condition of the next signal. If, for instance, both units show green, the significance is: medium speed at this signal, low speed at the next signal. The three-unit signal aspects are based on the same principles. The top unit indicates high speed, the middle unit medium speed, and the lowest unit low speed.

Charts on opposite page shown symbols for the aspects and wording of all the signal indications at 's Hertogenbosch

This is one of the automatic block signals near this new interlocking

If, for instance, a signal shows green / green the next signal can show white / white / white, white / green or green / or yellow. For white / green / white shunt moves to tracks not NX controlled, the signal will show yellow flashing at 180 per minute, the same indication as for driving in an occupied section; in both cases the driver has to be prepared to stop on sight.

The signals at Post "Bossche Gasfabriek", at post I and at the block post OH (direction Hedel), and those controlled from these posts, are light signals, and are therefore already adapted to the station signals. If, in the future, the entrance tracks are provided with automatic block system with light signals, these sections can conveniently be linked up with the existing NX controlled layout.

The track circuits are of the a.c. type, using Style B2 plug-in vane a.c. relays, and, as all are single-rail, balancing impedances are provided for each relay. Adjustable resistors are used at both feed and relay ends. Plug-in Style B1 or B2 relays are used exclusively for all safety circuits, while those employed in the communication circuits are Style A. The majority of the relays are concentrated in a relay room in the tower, adjacent to the control room, but there are two brick relay houses, each containing three relay racks, situated towards each end of the station area.

The cable is of local manufacture, that in the main runs being multi-conductor paper insulated, steel wire armoured, while local cables, also multi-conductor, are of heavy rubber insulation. Cables are terminated in large disconnection boxes, arranged with double doors at each side for convenience in installation and maintenance.

The plant includes the following d.c. sources: 136-volts battery for switch machines, 24-volts battery for switch indication and NX circuits, 12-volts battery for safety circuits. Further a.c. at 110, 24, 18 and 12 volts is available for track circuits, indication lamps and signal lighting.

Plant Communications

At several places in the layout telephones are installed in order to provide direct communication with

(Continued on page 311)

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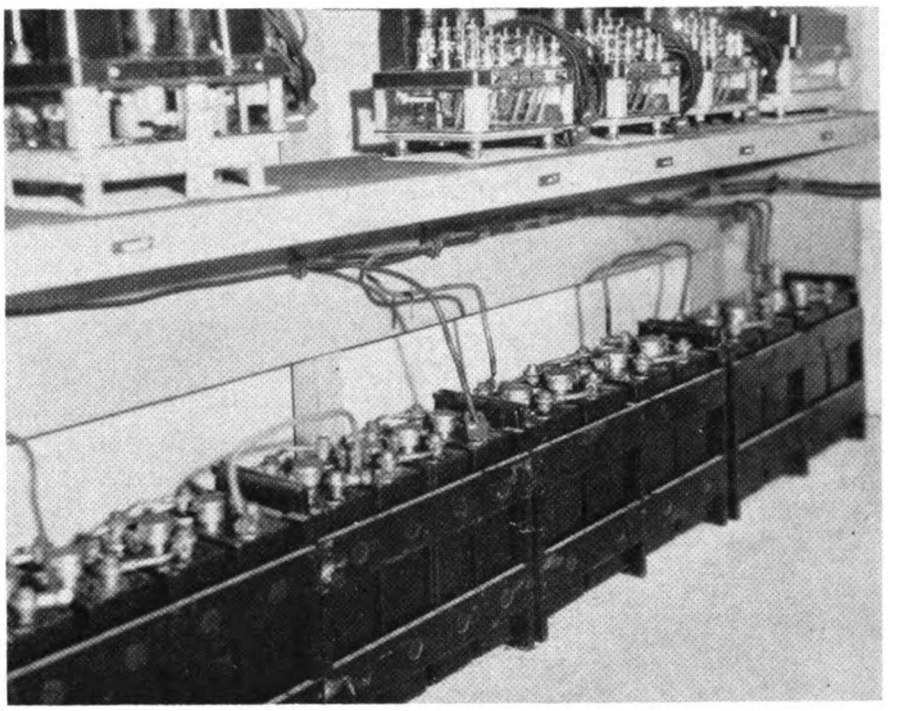

At typical power switch, machine is fed by a set of 21 cells of battery, 12 of which also feeds the line code equipment

The seven-conductor cables to signals are No. 14, and the track connections and switch motor circuits are single and 10-conductor No. 9. The wiring in the houses and cases is No. 14 flexible. The insulated wires and cable are of Kerite manufacture. Raco Clearview type arresters are used on the code line and on the local line circuits. The ground rods are ⅝ in. by 7 ft. Copperweld. The wiring connections at terminals, arresters and relays are the solderless type made by Aircraft-Marine Corporation.

The 440-volt a.c. distribution circuit extends in both directions from various towns where commercial power is available. The 440-110 volt line transformers at all locations are rated at 500 v.a., thus being interchangeable in case of replacements. These transformers are the air-cooled type made by General Electric Company. The transformers at power feed points are 2 kva. made by the Jefferson Electric Company and have connections to step the voltage either up or down in units of 10 volts.

At each power switch, there is a set of 20 cells of Edison B6H, 120-a.h. storage battery for operation of the switch motor. Twelve of these cells are used also to feed the line code equipment, and eight feed the signal lamps under certain conditions. Eight cells of B4H battery feeds the line circuits, and a similar battery is used at each intermediate signal.

At each electric lock on a hand-throw main track switch, there is a set of 16 cells of 500-a.h. Edison primary cells. These cells were reused from the previous automatic block signaling. Each track circuit under 500 ft. is fed by four cells of Edison 500-a.h. primary battery. Each track circuit over 500 ft. long is fed by two cells and there is an automatic unit rectifier across the battery to take all but about 20 m.a. of the load.

At the dispatcher's office, the code line circuit is fed by a type 603 Union Switch & Signal Company code line unit, rated at 115 volt, 50/100 cycle a.c., 30-220 volt, 0.4 amp. d.c., shown on the second shelf in one of the pictures herewith. The local circuits in the office are fed from two sets of 8 cells each of 120-a.h. Manchex type Exide storage batteries.

A telephone communication circuit is superimposed on the two C.T.C. code line wires. This system includes no ringing for calling. When an employee desires to talk with the dispatcher, he blows or whistles into the field telephone transmitter. This operates a voice-actuated relay in the office which lights a lamp and rings a bell on the dispatcher's machine. Then the dispatcher plugs in his telephone set to answer.

Motor Car Indicators

This project includes indicators to provide information concerning the approach of trains, for the benefit of men using motor cars. At each spring switch and at the instrument house at each power switch, there is a lamp-type indicator which is normally lighted. When an approaching train passes the next siding or when the dispatcher lines up for an approaching train, the white lamp is extinguished, and stays dark until the train passes beyond that indicator.

Also 130 semaphore type motor car indicators are provided at various places between sidings where the view of approaching trains is restricted. At these locations no a.c. power is available to feed indicator lamps, and, therefore, the indicators are of the semaphore type with 670-ohm coils. These indicators are controlled through contacts of track relays or contacts of DNL relays in series with signal line circuits. Details of the controls of such indicators are given in an article on page 370 of the June 1949 issue.

This C.T.C. project was planned and constructed by railroad forces under the direction of R. W. Troth, superintendent of communications and signals, the major items of signaling equipment being furnished by the Union Switch & Signal Company.

Holland

(Continued from page 305)

the tower in case of necessity. A central telephone exchange is located on the control panel in the tower, providing 6 connections with the platforms, 8 connections to signals and 6 connections to switches, relay cases, etc. Here are also located the telephone connections to neighboring posts and the loudspeaker installation of the station. A considerable amount of the shunting is carried out at the station, and dir··· telephone communication between the tower and the various strategically placed instruments in the yard has proved of great value.

An average of about 75 freight trains enter 's Hertogenbosch each day in addition to some 95 electric or diesel-electric passenger trains, and experience has already shown that this does not by any means represent the maximum capacity of this NX installation.

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